

# “Surely it will come again...”. Flood threat appraisal, mitigation strategies and protection motivation in Czech communities endangered by floods

Ivan ANDRÁŠKO <sup>a,b,\*</sup>, Kamila DOLÁK KLEMEŠOVÁ <sup>c</sup>, Lukáš DOLÁK <sup>c</sup>,  
Jakub TROJAN <sup>d</sup>, David FIEDOR <sup>e</sup>

## Abstract

A recent “shift” in flood risk management is associated with putting more emphasis on private mitigation and protection measures, and on shared responsibility. Based on case study research in the South Bohemian municipalities (Czech Republic) endangered by floods, this paper reports floods-related attitudes and actions of local inhabitants. A total of 305 respondents participated in a survey; responses and additional commentaries were examined through qualitative content analysis. Results show that though most of the local residents are aware of the constant threat, a minority of them take up any mitigation measures or have some strategy to handle a flood. Several cognitive biases and non-protective responses, the lack of interest and personal responsibility, perceived costs, as well as the prevailing low perceived importance of floods for the local quality of life, hamper improvements in general preparedness. From the viewpoint of Protection Motivation Theory, neither the locals’ threat appraisal nor their coping appraisal is high enough to sufficiently incentivise them to adopt private mitigation strategies and measures. Flood information seems to be at hand for local residents, who are, however, mostly not interested in using it. Perceived obscurities in handling the financial resources contribute to the prevailing unwillingness to participate financially in flood protection. Differences in perceptions and actions are associated with respondents’ individual characteristics (age, gender, level of education, previous experience with floods). Based on our findings, we discuss several relevant policy implications.

**Keywords:** floods, perception, private measures, threat appraisal, funding, experience, responsibility, Protection Motivation Theory, South Bohemia, Czech Republic

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## 1. Introduction

In recent decades there has been a “shift” in flood risk management (Bubeck et al., 2012; Fox-Rogers et al., 2016; Kuhlicke et al., 2020; Raška et al., 2020). It has been recognised that the large-scale technological protection measures (e.g. dams), and technocratic solutions (e.g. safety standards) are financially unsustainable (Bird et al., 2013; Cashman, 2011; Raška, 2015), and that they cannot completely eliminate a flood threat (Birkholz et al., 2014; Cashman, 2011; Ho et al., 2008; Fox-Rogers et al., 2016;

Soane et al., 2010). In actuality and in association with factors such as the illusion of security provided by them (McPherson and Saarinen, 1977), as well as the ongoing socio-economic development in the flood-plains (Bubeck et al., 2012, 2013; Henstra et al., 2018; Osti and Nakasu, 2016; Siegrist and Gutscher, 2008; Soane et al., 2010), and the effects of global climate change (Blöschl et al., 2019; Duží et al., 2017; Fox-Rogers et al., 2016), these technocratic “solutions” can even worsen the course and consequences of floods.

<sup>a</sup> Department of Environmental Geography, Institute of Geonics, The Czech Academy of Sciences, Brno, Czech Republic (\*corresponding author: I. Andráško, e-mail: [ivan.andrasko@ugn.cas.cz](mailto:ivan.andrasko@ugn.cas.cz))

<sup>b</sup> Department of Ecology and Environmental Sciences, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra, Nitra, Slovak Republic

<sup>c</sup> Department of Geography, Faculty of Science, Masaryk University, Brno, Czech Republic

<sup>d</sup> Department of Environmental Security, Faculty of Logistics and Crisis Management, Tomas Bata University in Zlín, Czech Republic

<sup>e</sup> Department of Geography, Palacký University in Olomouc, Olomouc, Czech Republic

As a result, there are calls for “more holistic”, “integrated”, or “softer” approaches (Bamberg et al., 2017; Birkholz et al., 2014; Bubeck et al., 2012; Fox-Rogers et al., 2016; Haidu and Nicoară, 2011). Putting more emphasis on risk communication, awareness raising, information campaigns, participatory planning, non-technological and private protection and mitigation measures, risk transfer instruments and shared responsibility, these newer approaches are expected to progressively complement the older ones (Bubeck et al., 2012; Fox-Rogers et al., 2016; Henstra et al., 2018; Hudson, 2020; Slavíková, 2018; Vávra et al., 2017).

Yet, the “shift” still seems to be rather more desired by flood risk management authorities, experts, or researchers; in fact, those who should be foremostly concerned with the related changes, do not appear to be interested in getting involved. More specifically, the flood plains’ inhabitants and local property owners, though they are expected so to do, prevailingly remain reluctant towards feeling responsible for, and taking their share in, flood-related planning, decision making, funding, and a take-up of protective and mitigation measures (Bird et al., 2013; Henstra et al., 2018; Terpstra and Gutteling, 2008; Vari et al., 2003); rather, they still prefer to rely on state or governmental support (Box et al., 2013; Brilly and Polic, 2005; Dzialek et al., 2013; Fox-Rogers et al., 2016; Klemešová and Andráško, 2015; Raška et al., 2020; Vari et al., 2003), and they refer the responsibility to “someone else” (Box et al., 2016, p. 1552). These issues are subject to examination in this paper.

## 2. Theoretical background and the recent state of knowledge

### 2.1 Private mitigation measures and strategies

As demonstrated, private protection and mitigation measures applied by people living in flood-prone areas can significantly reduce the risks, damages and losses associated with flooding (Grothmann and Reusswig, 2006; Kuhlicke et al., 2020; Lave and Lave, 1991). A variety of less or more demanding measures and strategies are at hand for individuals, as well as communities: some concern the arrangements of buildings and their equipment, others include the outer preventive and protection measures, or the activities related to proper reaction and coordination of activities (Bird et al., 2013; Brilly and Polic, 2005; Bubeck et al., 2013; Duží et al., 2017; Hudson, 2020; Kellens et al., 2013; Kuhlicke et al., 2020; Montgomery and Kunreuther, 2018). Yet, the lack of uptake of any of such measures is regularly observed (Box et al., 2013, 2016; Bird et al., 2013; Fox-Rogers et al., 2016; Osti and Nakasu, 2016; Soane et al., 2010). To address this societal “passivity”, and, through convenient political action to turn it into activities contributing to risk and damage reduction, a gamut of factors affecting people’s decision making and behaviour are currently studied. These include, though not exclusively, the perception and awareness of flood risk, information availability and sufficiency, the financial incentives and impediments, or the influences of personal experience and socio-demographic characteristics.

### 2.2 Threat appraisal and information availability

Perceptions of risk and awareness of the threat relate to the ways people subjectively assess the (potential) danger, and to the extent to which they possess and utilise the information about it. Thus, awareness includes the perception of a disaster’s probability and of its expected

consequences (Botzen et al., 2009; Bubeck et al., 2012; Frantál and Malý, 2017): these two components are currently combined within the concept of threat appraisal (Fox-Rogers et al., 2016). Since it has been found that awareness of the threat is an essential component of the flood preparedness (Armas et al., 2015; Box et al., 2016; Fox-Rogers et al., 2016; Grothmann and Reusswig, 2006; Kuhlicke et al., 2020; Osti and Nakasu, 2016), the availability and accuracy of relevant information are stressed in regard to the risk perception (see, e.g. Suykens et al., 2016). Yet, it has also been recognised that information availability and awareness of the threat do not have necessarily lead to desired personal/societal action (Klemešová and Andráško, 2015; Lave and Lave, 1991; Soane et al., 2010; Wachinger et al., 2013). Various communications issues (Cashman, 2011; Osti and Nakasu, 2016) and cognitive biases (Armas et al., 2015; Botzen et al., 2009; Burningham et al., 2008), can hamper information acquisition and utilisation by individuals, and the uptake of private protection and mitigation measures (Bubeck et al., 2012; Dzialek et al., 2013).

### 2.3 Funding of protection, financial incentives and impediments

Another factor to be considered is the financial context of private mitigation activities, usually including instruments such as ex-post compensation/relief mechanisms, ad hoc subsidies, and insurance. These instruments, provided by the public (governments) and private, market-based (insurance companies) subjects (or, eventually, by their public-private partnerships [PPPs]), are intermingled and applied in various ways and intensities in particular countries (see Hudson, 2020; Hudson et al., 2020a; Raschky et al., 2013; Slavikova, 2018; Surminski, 2018; Suykens et al., 2016).

Insurance is a prime risk transfer and recovery aid instrument: it tends to be voluntary, it is usually provided by the private market (or, eventually, by PPPs), and it is assumed that, through a price signal, it incentivises additional risk reduction by households (Hudson et al., 2019; Hudson, 2020; Hudson et al., 2020a; Kuhlicke et al., 2020; Montgomery and Kunreuther, 2018). Yet, the costs of taking out insurance, or of the private mitigation measures’ adoption, may be an issue (Duží et al., 2017; Montgomery and Kunreuther, 2018; Siegrist and Gutscher, 2008; Soane et al., 2010), especially for less wealthy people (Bera and Daněk, 2018; Kuhlicke et al., 2020). Associated also with social (in)justice concerns (Hudson, 2020; Surminski, 2018), the issue of costs is recently studied through the concept of affordability (Hudson, 2020; Kuhlicke et al., 2020). Not everyone has the financial resources needed to uptake the mitigation measures, and, similarly, not everyone can afford the insurance, especially if the premiums are high (Hudson, 2020). Moreover, paying for one of the options (insurance/mitigation measures) may, through a false sense of security, or through a lack of residual resources or willingness, rule out the other one (Bera and Daněk, 2018; Duží et al., 2017; Surminski, 2018). Furthermore, there is evidence of people’s negative experiences with the availability of insurance and the practices of insurance companies (Bird et al., 2013; Bubeck et al., 2013; Henstra et al., 2018; Lave and Lave, 1991; Surminski, 2018).

Another factor in the game is called the “charity hazard” (see Raschky et al., 2013) or, in the economics literature, the “crowding-out effect” (Slavikova, 2018, p. 96). In brief, this effect means that the existence of governmental relief programs and funds (funded, for example, by tax money) makes people passive regarding their own mitigation

activities, including the (lowered) insurance demand; thus, in the (macro)economic sense, the public sphere crowds-out the private one, and inflicts a “vicious cycle” (Raschky et al., 2013, p. 181) of insurance’s lower supply at higher prices. The more certain is the governmental relief, the larger is the crowding-out effect (Raschky et al., 2013). The validity and importance of crowding-out, however, has been recently questioned by several studies (see e.g. Slavikova, 2018).

Altogether, the relevant research suggests that to deal with the pertinent issues, and to provide reliable incentives for private flood-mitigation activities, there is a continual need to look for an “optimal mix” of the particular financial instruments (Hudson et al., 2019; Surminski, 2018; Suykens et al., 2016).

## 2.4 The role of experience and socio-demographic characteristics

A number of studies suggest that having a previous personal experience with floods has a profound impact upon the ways people perceive the threat or its potential consequences (Burningham et al., 2008; Kellens et al., 2013; Kuhlicke et al., 2020; Siegrist and Gutscher, 2008; Wachinger et al., 2013), or how are they prepared to face it (Bubeck et al., 2013; Kellens et al., 2013). This does not mean, however, that the concrete effects of experience on risk perceptions or mitigation behaviours are unambiguous or straightforward. For example, as Wachinger et al. (2013, p. 1052) put it, rather than by an experience with flood “in itself”, people’s perceptions are shaped by the severity of personal consequences experienced during past events. Moreover, mixed findings relate to the impact of the experiences of a flood on the likelihood of purchasing insurance (cf., Box et al., 2016; Bubeck et al., 2013). In addition, an experience of disaster does not necessarily lead to the higher odds that a household will adopt any private mitigation measures afterwards (Box et al., 2016; Duží et al., 2017; Soane et al., 2010).

In a similar fashion to personal experience, the role of people’s socio-demographic characteristics in affecting their floods-related attitudes and behaviours is widely investigated and discussed (Babcicky and Seebauer, 2017; Box et al., 2016; Cutter et al., 2003; Grothmann and Reusswig, 2006; Kuhlicke et al., 2020). Age is one of such characteristics, with increased attention paid to the social groups considered to be especially vulnerable, such as the elderly (Cutter et al., 2003; Fox-Rogers et al., 2016). Age can be also associated with the ways people perceive risk, or value and utilise different information sources (Babcicky and Seebauer, 2017; Box et al., 2016; Kellens et al., 2011). Moreover, it has been demonstrated that the differences related to other characteristics, such as gender (Armas et al., 2015; Brilly and Polic, 2005; Duží et al., 2017; Kellens et al., 2011) and education (Cutter et al., 2003; Henstra et al., 2018; Lave and Lave, 1991), are reflected in floods-related standpoints and activities as well. Yet, as in the case of experience, the role of socio-demographic characteristics has been recently questioned by studies seeing them as rather ambiguous predictors of floods-relevant standpoints and behaviour (Bubeck et al., 2012, 2013; Grothmann and Reusswig, 2006; Wachinger et al., 2013).

## 2.5 Theoretical underpinnings

A range of theories and social-cognitive models is currently applied to examine and explain the links between various components of risk-related attitudes and activities

(see for example: Kuhlicke et al., 2020). In these theories, the Protection Motivation Theory (PMT) has recently gained special attention and widespread application in flood risk research (e.g. Babcicky and Seebauer, 2017; Bamberg et al., 2017; Bubeck et al., 2012, 2013; Fox-Rogers et al., 2016; Grothmann and Reusswig, 2006; Hudson et al., 2020b; Kellens et al., 2013). The PMT model builds upon two main processes influencing motivation to protect oneself against certain risks: the threat appraisal (see Section 2.2, above); and the coping appraisal, which involves the perceived response (i.e. mitigation behaviour or a measure) efficiency, one’s own ability to carry out such response, and related costs (including time, effort etc.) of the response (Bubeck et al., 2012; Grothmann and Reusswig, 2006). The levels of the two appraisals, and their mutual combination, then result into two main kinds of responses, namely the protective (such as adoption of particular mitigation measure) and non-protective responses (see Sections 4.1, 4.2, 4.9). The basic PMT model has been extended recently through the inclusion of additional variables, such as personal characteristics, prior experiences, social environment and social capital features, and other factors (Babcicky and Seebauer, 2017; Fox-Rogers et al., 2016; Hudson et al., 2020b).

Yet, the overall explanatory or predictive power of the PMT, as well as of the other relevant theories and models, is still rather limited (Bamberg et al., 2017; Kuhlicke et al., 2020), and there are still no clear-cut links identified or even established between mitigation behaviours and its potential antecedents (Duží et al., 2017; Soane et al., 2010). The reasons for such a situation might reside in the presence of local (contextual) specifics (Duží et al., 2017; Vávra et al., 2017), and/or in the existence of additional, still unidentified and thus ignored factors (Babcicky and Seebauer, 2017; Kuhlicke et al., 2020).

## 3. The present study

### 3.1 Focus of the study

In the current research project, conducted in flood-prone areas in the region of South Bohemia in the Czech Republic, we examined the floods-related attitudes, motivations, intentions and activities of local inhabitants and private property owners. Several themes and issues were covered by the research, including risk perceptions, protection and mitigation measures, local quality of life, funding, floods-relevant information and knowledge, responsibility-sharing, prior flood experiences, and personal characteristics, as well as the connotations of floods.

Building upon the theoretical background and recent knowledge (Section 2), the present study and the pertinent research questions, are focused upon five interrelated areas of interest:

1. Private mitigation measures and strategies: What kinds of measures and strategies to mitigate the flood threat or future floods’ consequences do local people carry out?
2. Threat appraisal: Are the locals aware of the presence of the threat? How do the locals perceive the influence of floods upon their quality of life?
3. Information availability, sufficiency and usage: Do the local people feel sufficiently informed about the threat? What kinds of information sources do they utilise?
4. Participation in funding of the flood protection: Are the locals willing to participate in financing the floods-related activities?



5. The role of experience and socio-demographic characteristics: How do the peoples' floods-related attitudes and actions differ, taking into account their personal characteristics such as age, gender, level of education, and previous experience with floods?

Several studies and surveys with a focus similar to our research were recently conducted in the Czech Republic (Bera and Daněk, 2018; Duží et al., 2017; Klemešová and Andráško, 2015; Raška et al., 2020; Vávra et al., 2017). These researchers investigated the floods-related issues and perceptions in one (Bera and Daněk, 2018), two (Raška et al., 2020), four (Klemešová and Andráško, 2015), and ten or more (Duží et al., 2017; Vávra et al., 2017) locations, mostly villages/smaller municipalities or peri-urban areas (Raška et al., 2020) regularly affected by floods, and located in various parts of the country. The study of Vávra et al. (2017) partially (spatially) overlaps with our research, yet it was conducted approximately seven years earlier.

In the current study, we build upon the findings of these investigations, and refer to them in the text where appropriate and applicable. Our study expands the empirical knowledge related to flood risk perceptions and several associated issues in the Czech Republic. Moreover, though the concepts of threat appraisal and coping appraisal have been utilised in the current work of Raška et al. (2020), our study is the first, to our knowledge, to explicitly apply Protection Motivation Theory to study flood risk perceptions and protection/mitigation behaviours in the Czech Republic.

### 3.2 Geographical context

For a long period in history, floods have represented the greatest natural hazard in the Czech Republic (Bera and Daněk, 2018; Brázdil et al., 2006). The country has a rich history of applied protection and mitigation measures, ranging from “landscape friendly” solutions, such as fish cultivation lakes, to large-scale technological “solutions” (e.g. dams, river-bed straightenings, etc.). Nevertheless, there are around 2,500 km of rivers in the country that have been preliminarily delimited as high-risk in accordance with flood directive guidelines (Dráb and Říha, 2010). During recent decades, numerous flood events have been recorded (e.g. in 1998, 2006, 2009, 2013). The flood of 1997 was the Czech Republic's largest in the 20<sup>th</sup> century in terms of flow culmination rate, duration, area affected, casualties (52 lives) and material damage (62 billion CZK = approximately 2.5 billion USD). Another flood in 2002 claimed 19 lives and led to 70 billion CZK in damages (= approximately 2.9 billion USD) (Brázdil et al., 2006).

Incentivised and influenced by the destructive floods in 1997, and by the adoption of the European Water Framework Directive and the Flood Directive, several planning, strategic and legislative documents and frameworks (such as the Czech Flood Protection Strategy) were approved in the Czech Republic during the last two decades (Duží et al., 2017; Slavikova, 2018; Vávra et al., 2017). Other than dealing with some related aspects of flood risk management, in financial terms these documents highlighted the need to support flood prevention, risk sharing and the financial participation of municipalities and property owners in flood defence construction, and the limited provision of central government disaster relief (Slavikova, 2018). The reality, however, rather differs from such proclamations: recovery (ex- post) expenditures prevail, organised mainly by the central government on an ad hoc basis, and financed by the state budget (Slavikova, 2018; Vávra et al., 2017). The funding of prevention plays a complementary role, with the technical/structural measures still prevailing. Moreover, inconsistencies and obscurities have been observed as regards some of the financial flows and final recipients of flood expenses (Klemešová and Andráško, 2015; Slavikova, 2018).

Flood insurance in the Czech Republic is voluntary (Raška et al., 2020), provided (in bundled forms) by private companies only. The floods in 1997 brought the growth of (until then relatively cheap) premiums, with another increase in 2005 (Duží et al., 2017). Certain issues associated with the practices of insurance companies can be mentioned: disputes about the terms “flood” and “deluge” after the 1997 floods; the fact that some endangered properties are currently almost uninsurable (or they simply cannot afford to purchase the insurance due to high premiums); or the perceived obscurities and lack of information related to risk calculations and compensations (Duží et al., 2017).

Our research took place in the Blanice river basin in South Bohemia, the Czech Republic (see Fig. 1). Throughout history, the area has suffered floods regularly (Broža, 2005); the most recent were the floods in 2002, 2006, 2009 and 2013. A significant potential risk of flooding continues to threaten the area (Klemešová, 2016); large parts of the (inhabited) territory lie within a Q<sub>100</sub> flood zone.

### 3.3 Methods and procedures

Data were collected through a questionnaire survey carried out in six municipalities (see Tab. 1, Fig. 1) in May 2015. Respondents with a minimum age of 15 years were interviewed by trained researchers. We decided to use

Municipality	No. of inhabitants (age group 15+)	Sample size (% of inhabitants)*
Putim	393	4.0
Strunkovice nad Blaníci	1,014	4.0
Bavorov	1,272	4.5
Husinec	1,146	3.5
Vodňany	6,087	1.5
Protivín	4,099	1.5

Tab. 1: Municipalities, number of inhabitants and sample size

Note: \*The share of respondents was set at minimum of 3% of the total population in municipalities with less than 1,500 inhabitants, and at minimum of 1.5% in municipalities with more than 1,500 inhabitants)

Source: Czech Statistical Office, 2015; authors' processing

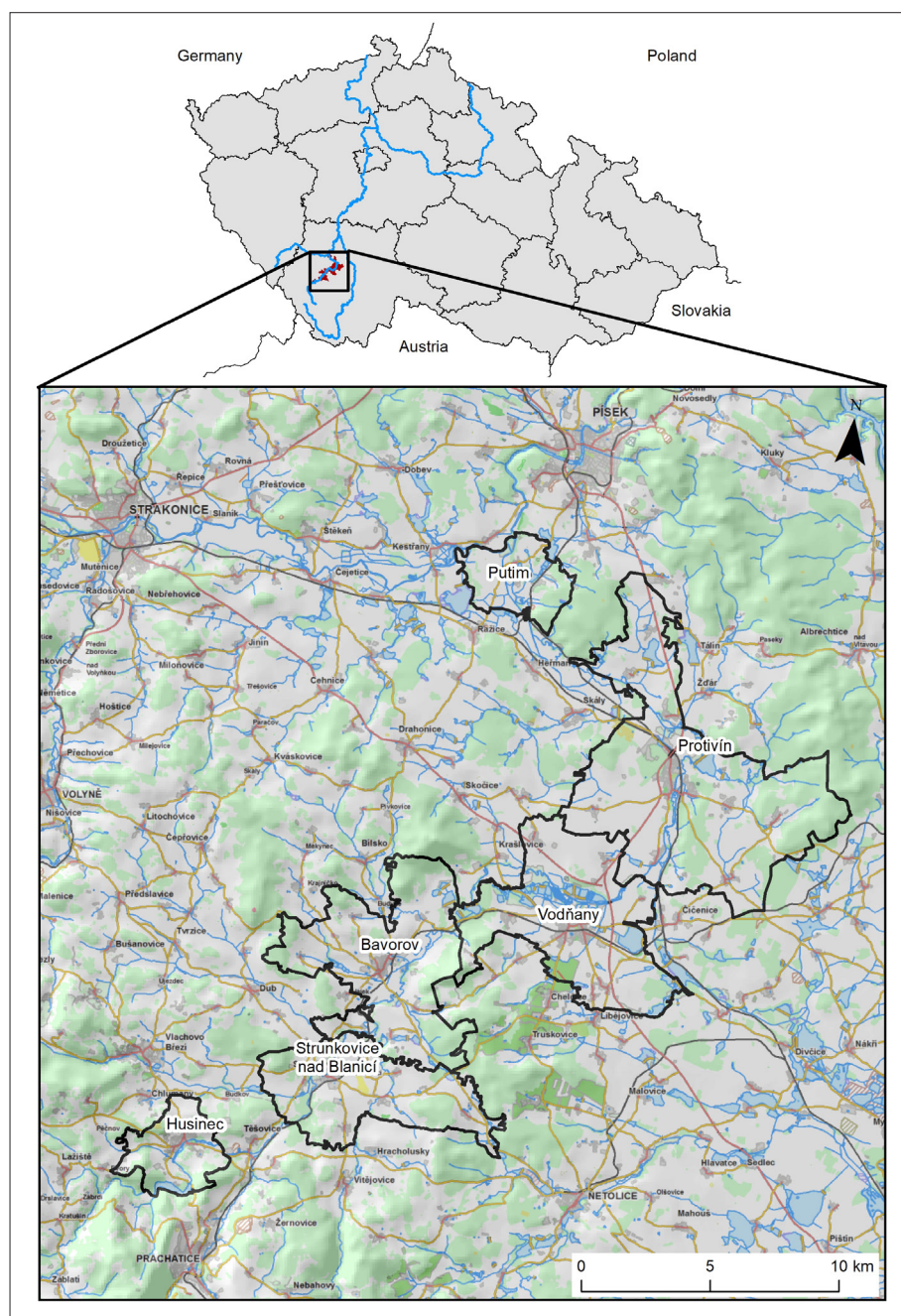


Fig. 1: Location of the study area in the Czech Republic, and the six research sites (named)  
Sources: Input data: ArcČR 500, 2019; ČÚZK, 2020; authors' processing

this age limit since in the Czech Republic, under common circumstances, 15 years is the age when persons obtain their first ID card or become responsible in terms of criminal law. Thus, from the viewpoint of flood risk perception and mitigation behaviour, we consider such persons knowledgeable enough for an appropriate (i.e. accordingly to their age) sense of responsibility, level of awareness, and abilities to assess the threat's significance, or to access and utilise the relevant information sources.

Furthermore, the pertinent research regularly reports on specifics associated with young persons' mitigation activities, or the ways they acquire relevant information (see Sections 2.4 and 4.6). For representativeness, according to the  $\chi^2$  test (comparison of  $\chi^2$  with critical values at significance level 0.05), the survey sample was adequate for each of the municipalities with respect to gender and age groups; but with respect to educational level it was partially

representative (see Tab. 2).

To cover the themes and issues of concern (Section 3.1), the questionnaire consisted of a set of open-ended and closed-ended questions. Such a combination of questions was designed to keep the questionnaire adequately concise and time responsive, yet still open and sufficiently exploratory to capture the respondents' individual, potentially idiosyncratic views of the relevant issues. The design also allowed, in most cases, for the closed-ended questions an option to accompany the response with further commentary.

This way, the survey reflected the still rather inadequate/incomplete state of knowledge regarding floods-related decision making and behaviours, and the limited explanatory power of the extant pertinent models and theories (Section 2.5). As opposed to assuming an a priori position with predefined categories of possible responses,

	Gender		Age group *		Educational level **	
	Critical value 3.84		Critical value 7.815		Critical value 7.815	
	Obtained statistic value ( $\chi^2$ ) and representativeness (yes/no)					
Putim	0.001	yes	2.168	yes	33.927	no
Strunkovice	3.324	yes	7.403	yes	2.252	yes
Bavorov	0.014	yes	3.653	yes	1.927	yes
Husinec	2.739	yes	7.259	yes	14.226	no
Vodňany	0.858	yes	3.801	yes	16.733	no
Protivín	2.650	yes	0.381	yes	11.244	no

Tab. 2: Representativeness of the questionnaire survey by means of the chi-square test

Notes: \*Classification: age groups: 15–29 yrs, 30–49 yrs, 50–64 yrs, 65+ yrs. \*\*Classification: incomplete/basic education; a high school without General Certificate of Secondary Education; a high school with General Certificate of Secondary Education; higher technical education/university graduation

Source: authors' processing

the approach we used stayed in touch with the recent state of knowledge and, at the same time, it was open enough to provide an insight into the local circumstances and specifics. Such an approach has been recently highlighted by several authors (see e.g. Duží et al., 2017, p. 260; Soane et al., 2010, p. 3035).

Data from a total of 305 questionnaires were analysed. Since the questionnaire covered a broad spectrum of research issues, not all of them, or, more precisely, not all of the questions used, could be analysed in this paper. Therefore, in the present study, we primarily focus on the questions (see Tab. 3) allowing us to answer the research questions set in Section 3.1. The responses are examined from the view of the whole sample, and in relation to four variables differentiating the respondents based on their age, gender, educational level, and whether they were, or were not, personally hit by floods in the past (e.g. their property has been damaged).

As regards the data examination, the qualitative content analysis (see for example: Hsieh and Shannon, 2005), used to code and categorise responses to the open-ended questions and the additional commentaries to closed-ended questions, was accompanied by descriptive statistics (especially cross-tabulations and frequency analyses).

## 4. Results and discussion

### 4.1 Private mitigation measures and strategies

Less than one half (44%) of the respondents stated that they have some strategy or have taken up any private measures to handle a flood. Reactive strategies (escape, evacuation) prevailed, together with “simple” and vague adaptive strategies and recommendations (e.g. not to live by a river), and with the utilisation of mitigation measures such as moving the furniture or usage of water resistant

Area of interest	Question	Type of question
Mitigation strategies and measures	Do you have any private strategy (or do you take up any measure) to handle a flood?	open-ended
Threat appraisal	Do you think that the flood might come to the municipality you live in again?	closed-ended with possibility of further commentary
	How much do the floods influence quality of life in the municipality you live in?	closed-ended with possibility of further commentary
Information availability and usage	Do you feel to be sufficiently informed about floods-related threats and options of protection?	closed-ended
	[in case of “no” answer to previous question] What would you like to learn more about, and in what way would you prefer to acquire the relevant information?	open-ended
	Do you know some web pages dealing with the floods-related issues?	closed-ended
	[in case of “yes” answer to previous question] Which of this kind of web pages do you know and use?	open-ended
Participation in funding of flood protection	How often (when) do you use the relevant web pages?	closed-ended with possibility of further commentary
	Do you think that the inhabitants of, and the owners of properties lying within, flood-prone areas, should participate in financing [whatever kinds of] the flood protection measures?	closed-ended with possibility of further commentary
	What is your view about the flood tax, introduced in the Czech Republic in 2011?	open-ended

Tab. 3: Areas of interest and wording of the questions used in the survey

Source: authors' processing



materials (see Tab. 4). Yet, the most frequent response was in the “miscellaneous/other” category, subsuming a mixture of answers, and often associated with resignation, mockery or wishful thinking.

The reasons for not having any private mitigation strategy were specified in about one quarter of such cases: the most frequent were signs of disinterest or ignorance (“I am not endangered by a flood”, “I live on a hill, so I don’t care”), avoidance, underestimation or mockery (“I’ll rather have a beer”, “I simply avoid news”), resignation (“you cannot stop the natural element”), or responsibility transfer (“why me?”, “ask the mayor”, “not my responsibility”).

Using the classification of adaptive behaviours proposed by Kuhlicke et al. (2020), our results show that in the surveyed communities:

- i. individual behaviours and actions, i.e. those focused upon protecting or saving oneself (or the members of the given household) and one’s own properties, dominated over the measures concerning other members of the community (such as “help to the victims”), or measures involving some kind of concerted common effort;
- ii. the investment/one-time behaviours (e.g. sandbagging, escape) prevailed over the routine/repetitive ones (e.g. regularly monitoring the weather forecast); and
- iii. the relatively minor, low-cost measures (e.g. sandbags, “flood suitcase”) prevailed over the high cost ones (such as more demanding house adjustments).

Similar findings have been recorded elsewhere (e.g. Bera and Daněk, 2018; Brilly and Polic, 2005; Duží et al., 2017; Fox-Rogers et al., 2016; Soane et al., 2010).

Furthermore, in concordance with Bird et al. (2013), we noticed more frequent utilisation of reactive strategies (escape) than of preventive ones. Similar to other studies, including those from the Czech Republic (e.g. Bera and Daněk, 2018; Duží et al., 2017), examples of both wet and dry flood-proofing (Hudson, 2020; Hudson et al., 2019; Montgomery and Kunreuther, 2018) were observed in the study area: the first one of them limits damage once water has entered a building, while the other one limits the likelihood of flood water entry (Kuhlicke et al., 2020).

Living outside of the flood-prone areas seems to be the most effective instance of dry flood-proofing, and so permanent relocation may look like an appropriate option; however, due to the related costs, or emotional attachment to the place, intentions to relocate permanently are rather rare (Bera and Daněk, 2018; Duží et al., 2017; Dzialek et al., 2013; Klemešová and Andráško, 2015). In our study area, the relatively frequent occurrence of recommendations such as “to live on the hill”, suggests that locals are aware of such a mitigation strategy and its effectiveness. On the other hand, such recommendations were almost absent amongst the respondents previously hit by floods (see Section 4.5), and the concrete intentions to move out were specified in singular cases only. An important methodological limitation needs to be taken into account in considering such findings, however: our survey did not cover people who (possibly) had already moved out of the area/municipality, but only those respondents who, for whatever reasons, stayed to live there.

Yet the most important finding seems to be a general prevalence of passivity, vagueness in what to do, lack of uptake of any private measures, unwillingness to engage personally, the transfer of responsibility to someone else, and non-protective responses such as wishful thinking, fatalism, resignation, avoidance, or mockery (see also Section 4.2). Our study is not an exception in this sense, as such observations are rather common (Box et al., 2013, 2016; Brilly and Polic, 2005; Fox-Rogers et al., 2016; Osti and Nakasu, 2016; Soane et al., 2010).

#### 4.2 Threat appraisal

Most of the respondents (94%) are aware of the constant threat, admitting that the municipality they live in might be flooded again. Additional commentaries regarding perceptions of the threat were divided into seven categories (see Tab. 5). Due to their frequency, most respondents acknowledged their awareness of the presence of the threat; resignation and fatalistic views that people are just not able to do anything against the floods followed; and third most frequent were wishful thoughts and remarks about environmental cues such as rain or river. The remaining commentaries were associated with emotions such as fear

Categories of strategies/measures (and examples of answers)	Frequency (%)
<i>reaction to the immediate threat</i> (“to pack up the most important things and to escape”, “just to leave”, “to take the kid, pack up the things and leave”)	19.6
<i>adaptation and avoidance</i> (“to avoid the flood areas”, “to live further from the river”, “to live on the hill”)	17.6
<i>mitigation measures</i> (“moving the furniture to the upper floor”, “to use the solid wood furniture”, “if possible, nothing from the glued materials”)	16.7
<i>weather forecast/news/internet</i>	11.8
<i>observing the river</i>	10.8
<i>sandbags</i>	9.8
<i>prepared for evacuation</i> (“to have the things ready”, “flood suitcase”, “to be prepared for evacuation”)	7.8
<i>protective walls/barriers around the house</i>	3.9
<i>help to the affected</i> (“I’ll help the victims”)	3.9
<i>preventive stock</i> (water, food)	2.9
<i>moving away</i>	2.9
<i>miscellaneous/other</i> (“just to hold on”, “to sit on the hill and have a beer”, “to buy a boat”, “to pray”, “to take out insurance” [one case only!], “to open the door and let the water run through”, “to follow the orders of the flood commission/mayor”)	23.5

Tab. 4: Categories of mitigation strategies and measures  
Source: authors’ field research and processing

Categories of commentaries (and examples of commentaries)	Frequency (%)
<i>awareness</i> (“so sure/surely it will come again”, “anytime”, “we expect it”, “the threat is permanent”, “maybe tomorrow”)	44.4
<i>fatalism</i> (“you cannot prevent it”, “people cannot do anything”, “it’s just nature”, “we are not able to influence it”, “you cannot change the weather”)	18.5
<i>wishful thinking</i> (“one hopes it won’t come anymore”, “hopefully the flood will not come again”)	9.3
<i>environmental cues</i> (“if it rains a lot [a flood will come again]”, “the Blanice river”)	9.3
<i>worries, fear</i> (“people are worried”, “I’m still scared”)	7.4
<i>blaming, responsibility transfer</i> (“stupid, they released the dam at once”, “dyke’s too low”, “it depends on the river board”, “there were no floods under the Communists”)	7.4
<i>optimism</i> (“probably, they [floods in the future] will be smaller”)	7.4

Tab. 5: Categories of commentaries concerning the potential flood threat

Source: authors’ field research and processing

or worries, with the blaming of someone or something to be responsible for causing (or not preventing) the flood, or with optimism regarding the future course of floods.

Regarding the second component of the threat appraisal, the perception of a floods’ consequences, Figure 2 shows how respondents assessed the impact of floods upon the (quality of) life in their municipality: while 22% see such an impact as less significant, the shares of those seeing it as (rather) significant, and those perceiving it as insignificant (having no influence) were relatively balanced. Additional commentaries on this topic most often (one third of cases) mentioned feelings of fear or worries (“people are afraid”, “just a bit of rain, and people start to worry”, “life in fear”, “bad dreams”), followed by views that the impact of floods concerns those living by the water only, or that the floods’ influence is important only during the floods.

Lack of risk awareness has been observed only occasionally (Bird et al., 2013; Botzen et al., 2009; Burningham et al., 2008; Wallace et al., 2016), yet this is not the case in the area under investigation. Rather, similarly to some other studies (Box et al., 2016; Klemešová and Andráško, 2015; Lave and Lave, 1991), we recorded high awareness of the threat, which is, however, not accompanied by equivalent preparedness. A significant proportion of the awareness-related comments contained signs of various cognitive biases, recently described as the “ostrich effect” (Burningham et al., 2008) or “cognitive dissonance” (Armas et al., 2015), associated with the non-protective responses (Bubeck et al., 2012; Fox-Rogers et al., 2016), i.e. responses that cannot prevent future damages. Although wishful thinking or undue optimism might help to alleviate negative feelings, such fear and worries (Grothmann and Reusswig, 2006), together with standpoints of helplessness or fatalism (nothing can be done against floods), might hamper private activity and the uptake of mitigation measures (Bubeck et al., 2012, 2013; Dzialek et al., 2013). Possible underestimation of the threat, and its concurrence with the non-protective responses, need to be seriously taken into account. As Duží et al. (2017) suggest,

though people might be aware of the threat’s presence, this does not mean they do not underrate the risk’s actual degree. Another issue is the reliance upon someone/something else rather than one’s own activity (Box et al., 2013; Brilly and Polic, 2005; Duží et al., 2017; Dzialek et al., 2013; Fox-Rogers et al., 2016; Klemešová and Andráško, 2015). For example, in comparing two different Czech communities, Raška et al. (2020) showed that while people may acknowledge the floods to be somehow inevitable, their risk perceptions can be reduced through reliance upon public protection measures or, contrarily, increased by the experience of these measures’ unreliability.

The second part of risk perception, i.e. the perceived consequences, needs to be considered as well. In our study, large shares of local residents have seen the impact of floods upon their lives as less significant or insignificant, and such a situation has been observed elsewhere (Jakubcová et al., 2016; Vávra et al., 2017). A possible explanation can reside in a flood’s impermanence and low-frequency nature (Raška, 2015; Raška et al., 2020; Soane et al., 2010), or, if floods appear regularly, in people’s adaptation to them (Bera and Daněk, 2018; Duží et al., 2017; Jakubcová et al., 2016). In both cases, however, the motivation to take private precautionary measures might be inhibited. For instance, as found in another study from the Czech Republic (Vávra et al., 2017), many people living in flood-prone areas often consider floods to be a part of the regular land management regime, or even a unique, advantageous feature of local life. Thus, according to such people, these “natural events” should be rather respected, and there is no need to eliminate them completely. In our study, however, the negative or neutral and indifferent views of the floods’ impact upon local lives prevailed.

#### 4.3 Information availability and sufficiency

Most respondents (84%) felt that they were sufficiently informed both about the threat and about the protection and mitigation options. A minority of respondents (27%)

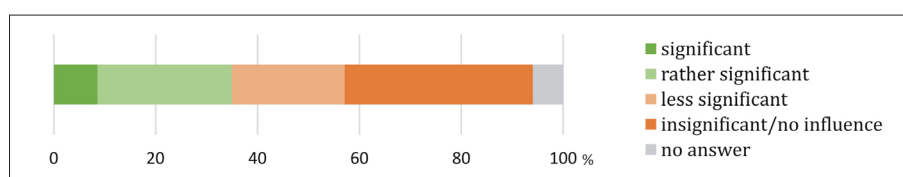


Fig. 2: Perceptions of floods’ influence upon local quality of life

Source: authors’ field research and processing



asked for any additional information about floods: even if they did so, they were usually not able to specify what such information should cover (standpoints that nothing can be done better, or that it does not matter at all, prevailed, followed by comments such as “I do not know” or “I have got no idea”). Calls for earlier warnings, or for more information about private protection measures, or about the threat and its spatial extent, appeared in singular cases only. As for the sources of floods-related information, respondents chiefly relied on local broadcasting. Other sources included firemen and rescue services, the representatives of local government, neighbours (“people just tell each other”), the Internet and newspapers. In-between respondents asking for additional information, the preferred way to get such information was the Internet. Less than one quarter of all the respondents stated that they knew some floods-relevant web pages, and about 60% said they never use such web pages as sources of information. Out of the rest, most respondents used such sources of information only once the flood had already come (i.e. during the flood). The mostly utilised sources were the websites of the Czech Hydrometeorological Institute, of the Vltava River Board s.e., and of particular municipalities.

The lack of available information or the insufficiency of floods-relevant information are part of the factors traditionally considered in the insufficient uptake of private mitigation measures. The expectation of the “information deficit model” (Fox-Rogers et al., 2016, p. 331) is that once people are informed about a threat and options for its mitigation, they will act accordingly. As already demonstrated (Bubeck et al., 2012; Lave and Lave, 1991; Soane et al., 2010; Wachinger et al., 2013), however, the information availability alone is insufficient in promoting people’s mitigation behaviour. Rather, it seems to be important whether people actually appreciate, acquire/access and utilise the relevant information. In our study, the respondents were mostly satisfied with the information they have received, but this satisfaction was associated with generally low interest in this information and its usage (particular groups of locals, however, compared to the others, displayed higher interest in information utilisation – see the following Sections, especially 4.5 and 4.8). Thus, it cannot be clearly stated whether the available information

is really sufficient or, in fact, only perceived that way, since people do not take too much interest in it (especially in times when the threat is not imminent). Nevertheless, the underutilisation of information sources and lack of interest in being informed were recorded also elsewhere (Box et al., 2016; Lave and Lave, 1991; Osti and Nakasu, 2016; Soane et al., 2010), and our findings regarding the prevailing satisfaction with available information correspond with observations made in other Czech communities (Bera and Daněk, 2018; Raška et al., 2020). Furthermore, our findings that people prefer local sources of information (such as broadcasting, personal contacts) are in line with those of other researchers (Bera and Daněk, 2018; Brilly and Polić, 2005) as well. The importance of personal relations and informal social ties in speedy dissemination of the threat-related information was recently mentioned by Babčický and Seebauer (2017).

#### 4.4 Funding of protection and mitigation measures

Slightly more than one half (55%) of respondents thought that the local owners of properties should not financially participate in the flood protection, while less than 30% held the opposite view. Further commentaries on the topic (see Tab. 6) most often mentioned the inappropriate excessiveness of any financial burden, or the issues of insurance such as its unavailability or unattainableness. The other recurring kind of commentary, the “why should they/we pay, when...”, was usually supplemented by some kind of “explanation” of the respondents’ reluctance towards participation. Most recurrent was the reference to “someone else’s responsibility”. Some respondents also pointed to “selective” participation (some people should pay, and some not), some focused on the personal responsibility of “them” (i.e. of those people living in the flood zones), and some agreed with some kind of “smaller” participation.

The flood tax, introduced in the Czech Republic in 2011, meant a further monthly deduction of 100 CZK (approximately €3.70) from the already-taxed income, and remained in force for only one single year, and that is probably why about one quarter of respondents expressed lack of knowledge about it. An agreement with the tax (i.e. a willingness to pay the tax in case of its reintroduction)

Categories of statements (and examples of statements)	Frequency (%)
<i>financial issues and insurance</i> (“who can afford it [financial participation] these days?”, “even if someone would like to insure the house, the amount is so high it is better to keep the money at home”, “they [insurance companies] didn’t want to insure them, cos they live in the flood area”)	34.2
<b>WHY TO PAY...:</b>	
a) ...when someone else should pay/take care (“rather the town”, “the state should take care of them”, “the construction was allowed in there, so why should people pay?”, “the whole community should take care”)	21.1
b) ...when there are taxes/insurance (“and so why do they pay taxes?”, “they already pay bigger insurance just because they live next to the water”, “they are insured, so why should they pay?”, “once they pay insurance, the state should take care”)	10.5
c) ...when those people just live in there (“why should they pay more just because of the place where they live?”, “they are beaten by the life in there, so why should they pay?”)	7.9
<i>selective participation</i> (“those who moved in there voluntarily, should pay, those who were born in there, shouldn’t”, “only those [should pay], who are concerned [get flooded] regularly”, “those should pay, who have got enough money for that”, “old people shouldn’t pay”)	21.1
<i>personal responsibility of “them”</i> (“it was their decision to live there”, “they chose the place for living”)	13.2
<i>“my” personal responsibility</i> (“it is just my responsibility”)	5.3
<i>“smaller” participation</i> (“with smaller amount of money, I would participate”)	5.3

Tab. 6: Categories of participation statements regarding financial participation  
Source: authors’ field research

Categories of statements (and examples of statements)	Frequency (%)
<i>absence of knowledge about the tax</i> (“never heard about it”)	23.2
<i>solidarity</i> (“people should help each other”, “we cannot turn our back on them”)	10.6
<i>rightfulness of the tax</i> (“it makes sense”, “right decision”)	10.2
<i>“conditioned” agreements</i> (“if it would serve the right purpose”, “if there was not corruption all around”, “if someone won’t steal the money”, “but the money must be used for help after the flood”, “but it must really help”)	8.9
<i>strict refusal</i> (“nonsense/crap”, “I wouldn’t accept the money”)	6.9
<i>undemanding tax amount</i> (“100 Czech crowns is not so much/it won’t hurt us”)	5.3
<i>obscurities in using the money</i> (“I don’t know what for it was used”, “solidarity is fine, but we pay for irresponsibility and sloppiness”, “government’s scam, where is the money?”)	5.3
<i>feelings of injustice</i> (“it is unfair”, “I won’t pay money to anybody!”)	4.5
<i>responsibility of someone else</i> (“why should it be paid by people?”, “there is enough money in the state cash register”, “politicians should take it off their salaries”, “it should be paid by those “experts” who straightened the river beds...”)	3.7
<i>distrust and suspicions</i> (“the money would have been stolen anyway”, “the politicians will just steal it”, “a lot of money gets “lost” in the Czech Republic”)	3.7
<i>overabundance of taxes</i> (“there is already enough of taxes...”)	2.0
<i>sufficiency of insurance</i> (“that is what the insurance companies are here for”, “I pay for the insurance, so why should I contribute?”)	1.6
<i>agreement with the tax without further commentary</i>	19.1
<i>disagreement with the tax without further commentary</i>	8.5

Tab. 7: Categories of statements about the flood tax  
Source: authors’ field research

was reported in 45% to 54% of responses (see Tab. 7). The numbers are approximate in this case, since some of the respondents’ commentaries were extensive and it was not always possible to decide clearly which kind of standpoint they expressed. Those agreeing with the tax often pointed to the need of solidarity, to the rightfulness of the tax, or to its undemanding amount. Some respondents conditioned their agreement with various “ifs” and “buts”, suggesting doubts about how the income from the tax would be used. Such doubts and suspicions served as reasons to refuse the tax by another groups of respondents: some pointed to obscurities in handling the money; some believed in the tax’s ineffectiveness; some argued that the financial issues are someone else’s responsibility; and some expressed distrust and worries that the money will “disappear” or will be stolen. Altogether, such opinions accounted for about one quarter of the responses.

Our research pointed to several issues associated with the funding of flood protection in the study area. Most of them have been observed elsewhere as well, and they are frequently discussed in the relevant literature (see also Section 2.3). The unwillingness to participate financially, noticed also in other Czech communities (Raška et al., 2020), is linked with expenditures often considered by people to be excessive (Bird et al., 2013) and unaffordable. This might be the case for insurance as well. Moreover, another issue often associated with insurance is its unavailability due to insurance restrictions (Bubeck et al., 2013; Lave and Lave, 1991). Once again, the “seeking out” of “someone” bearing responsibility, observed also in another study from the Czech Republic (Duží et al., 2017), appears to be an important factor here. As our findings suggest, in this way a local community might become polarised by those who should pay and those who should not. Typically, as well, the expenses are expected to be paid by government (Henstra et al., 2018; Vari et al., 2003). As stated by Raschky et al. (2013, p. 181), the actual existence of government relief funds, past personal experience and/

or media reports of past catastrophes and government aid, seems to feed individual beliefs that the government will provide financial catastrophe assistance.

The government can gain relevant financial resources through taxes, a step, which, as observed in our study, was rather acceptable to locals than direct participation. As our results suggest, the importance attributed to solidarity, recorded in another Czech community as well (Bera and Daněk, 2018), and the undemanding tax amount could be of importance in this case. Yet, the support for the tax seems to be tentative and it can easily turn to refusal due to distrust and suspicion about how the revenues will be used (Klemešová and Andráško, 2015; Thieken et al., 2006; Vari et al., 2003). The resulting situation then is a paradoxical one: people tend to rely on the government to take care of the expenses, yet it is the same government that many of them do not trust.

#### 4.5 The role of experience

Previous personal experience with floods is reflected in respondents’ floods-related standpoints and behaviour. Approximately 60% of the affected (i.e. of those respondents, who experienced, for example, damage to private property during previous floods) claimed to have some strategy to deal with a flood: reactive and mitigation strategies and measures (including the usage of sandbags) dominated (mentioned by about one third of responses), followed by (with much lower importance) preventive strategies and protective measures (e.g. to have the things packed, to build protective walls). Not having any strategy was, in this group, usually justified by the impossibility of doing anything against floods, or through reference to the responsibilities of someone else (mostly some authorities). The unaffected had some strategy in less than 37% of case: they preferred strategies such as to avoid living in flood-prone areas, and to watch the news or weather forecast, yet mostly they stated that they just do not need any strategy at all.

In additional commentaries associated with flood awareness, the affected (compared to the unaffected) more often mentioned the instant presence of a threat, wishful thoughts (the second most frequent kind of comments for this group), environmental cues such as rain or the river (more than twice more often), fear and worries. Fatalistic views and opinions that nothing can be done against floods, together with blaming someone or something to be responsible for causing (or not preventing) the flood, were rather stated by the unaffected.

While the affected and the unaffected were similarly aware of the threat (a slightly higher awareness was recorded amongst the affected), they differed markedly in their perception of the floods' impact upon the local quality of life: nearly four times more often (19%) did the affected see such an impact as significant (often emphasising the related fear and worries), and roughly two times less frequently (24%) they said floods have no influence upon life in their municipality.

For some of the sources of information about floods, the affected more often stated communication with firemen and local representatives, rescue services, and emergency warning sirens (never mentioned by the unaffected). About two times more frequently they also asked for improvements of the local broadcasting and lectures about floods. The usage of floods-relevant web pages was almost twice more frequent amongst the affected as well (nevertheless, half of them said they never use such web pages).

The willingness to financially participate in flood protection was significantly lower amongst the affected (68% disagreed), and three times more often they talked about the injustice of being expected to pay only because they live in flood zones, about the excessiveness of any additional financial burden, and about the issues of insurance unavailability. On the contrary, the unaffected often (18% of cases) talked about the inadequacy of paying (more) due to already paid taxes or insurance (such a commentary did not appear in a single case amongst the affected), and also three times more often than the affected pointed to the personal responsibility of the people living/owning properties in the flood zones.

Disagreement with the flood tax was expressed by one third of the unaffected, and more than one half of the affected. Twice more often the unaffected stated they do not know anything about the tax, or that the tax is unfair. Criticism and doubts associated with the ways of using the tax revenue appeared four times more often in the commentaries of the affected (it was one of the most frequent comments amongst these respondents). More often they also doubted the effect of the tax, stated that the tax is useless, a crap, or financially too demanding, and suggested that the money will be stolen anyway.

Similar to our findings, the significant role of personal experience with a flood in influencing the flood risk-related thinking, emotions and behaviour was previously indicated by many other studies on the topic (Bubeck et al., 2012, 2013; Grothmann and Reusswig, 2006; Ho et al., 2008; Kellens et al., 2013; Lave and Lave, 1991; Raška, 2015; Siegrist and Gutscher, 2008; Wachinger et al., 2013). Our study supports the view that being personally affected by a flood usually raises the chances that people will adopt some private mitigation strategies or measures (Bera and Daněk, 2018; Bubeck et al., 2013; Kellens et al., 2013). On the other hand, we found that there was still a large share of the affected not adopting any measure or strategy (cf. Soane

et al., 2010), and turning to a non-protective responses (Fox-Rogers et al., 2016) such as the wishful thoughts, fatalism or standpoints of helplessness (in our study, wishful thinking was markedly prevalent amongst the affected). Our findings also show that the affected associate flood threat with specific connotations (e.g. rain will bring a flood) or, as observed elsewhere (Siegrist and Gutscher, 2008), with emotions such as fear or anxiety. In accord with Soane et al. (2010), we observed the effect of experience with floods on a lowered sense of one's own responsibility for flood protection.

Another aspect is perception of the risk: when taking into account threat awareness, while we did not observe any significant difference between the affected and the unaffected, a noticeable difference appeared regarding the potential consequences of floods for local quality of life. More specifically, the affected envisaged such consequences as much more severe, a finding which accords with other studies (Bera and Daněk, 2018; Burningham et al., 2008; Kellens et al., 2013; Siegrist and Gutscher, 2008; Wachinger et al., 2013). Thus, overall threat appraisal is higher amongst the affected. Our results also show that being personally affected by a flood is associated with more frequent usage of more information resources, which is consonant with the findings of Box et al. (2016), and with less willingness to pay for flood protection (either through direct participation or taxes).

#### 4.6 The role of age

Regarding floods-related strategies, the youngest respondents most often (one third of answers) relied on (watching) news, weather forecasts, the Internet and other information sources (in comparison, among the oldest respondents no one mentioned this kind of strategy), or on reactive strategies such as escape and evacuation (while the preferences of such strategies gradually decreased with increasing age). Together with the oldest respondents, they also most often stated that it is not necessary to have any strategy at all. The youngest also least often talked about avoidance of life in flood-prone areas: this strategy was stated four to nearly seven times more often in the other age groups, most often amongst the oldest respondents. Mitigation strategies such as moving the furniture into the upper floor or using water-resistant materials were mostly mentioned by those aged 50 to 64 (more than one third of their commentaries), while in the other age groups the importance of such measures was much (approximately three times) lower.

The tendency to relegate the responsibility to someone else was relatively most frequent amongst the oldest respondents. The oldest respondents also attributed the least importance to the Internet as a source of floods-relevant information, as less than 7% of them mentioned it compared to the 32% average for all respondents. They rather relied on personal contacts with neighbours and local authorities. In general, the utilisation of floods-related web pages decreased with increasing age.

The youngest respondents were the only age group in which agreement with financial participation on flood protection prevailed – more than half of them agreed, while in the other groups this proportion did not exceed one third. Even so, these respondents also most often referred to the responsibility of the flood zones' inhabitants, in 33% of cases, which was more than three times more often than the other age groups. Simultaneously, they were also those least often "excusing" the inhabitants and owners of properties with the "why should they/we pay, when..." kind of answer (two to



five times less often than in the other age groups). The oldest respondents, on the other hand, most often pointed to the (excessive) financial burden and preferred some “smaller” kind of participation. The highest shares (around 40%) of those agreeing with the flood tax were recorded in the two older age groups. Yet it must be noted that in these groups the disagreement was highest as well (around 30%), since in the two younger age groups those leaving the question about the flood tax unanswered prevailed (most often they just did not know about the tax). The older two groups had also in common the highest frequency of doubts about the tax’s usefulness and effectiveness, of worries that the money will be stolen, and, especially, of complaints about the obscurity in handling them.

Our findings are partly in line with those of other researchers. As revealed by Duží et al. (2017), the presence of children can positively influence the adoption of flood risk protection measures by a household. Although the presence of children was not included in our survey items, the content of additional commentaries suggested that children really might be an important driving factor for adoption of, especially, reactive strategies (the “to take the kid, pack up the things and leave” kind of commentaries). We also observed that increasing age was associated with decreasing preferences for reactive strategies, and of information sources such as the Internet (Box et al., 2016). Similar findings were reported in another Czech community, where Bera and Daněk (2018) recorded higher reliance upon the Internet and mobile devices amongst the younger people, while the senior residents relied on more traditional ways of information acquisition. The view of Babčický and Seebauer (2017) that risk perception decreases with age was not supported by our study. The lack of experience amongst the youngest respondents, and the long-term experience of the oldest ones (Birmingham et al., 2008), might be represented in the similarity in neglecting the need to have any specific mitigation strategy, yet also in differences in case some strategy is adopted (cf. Soane et al., 2010), as our study shows. Age-associated previous experience also seems to be reflected in the older respondents’ negative standpoints towards one’s own responsibility for flood protection. A Canadian study (Henstra et al., 2018) suggests that older people might be more willing to pay for flood protection, yet our findings are different. Possible explanations might reside in different financial opportunities (Czech respondents were not completely unwilling to pay, they preferred, however, some “smaller” participation) and, once again, in previous experience (Czech respondents were strongly sceptical about how the money will be used).

#### 4.7 The role of gender

Two times more often, men (20%) compared to women, stated they do not need any strategy to handle a flood. Their most preferred strategy was to avoid living/building houses near the river (they mentioned it twice as frequently as women). Women preferred (more than 20%) strategies such as moving the furniture and house equipment (into upper floors) and using water resistant materials. They also (three times more often than men) talked about the precautions of having things packed up and prepared for the sake of a possible evacuation.

Concerning their comments associated with a flood risk, men twice more often declared their awareness of the threat, and also more often blamed someone/something else. Women’s comments were more often associated with fear and worries,

but also optimism. Men demonstrated better knowledge of the floods-relevant web pages (more than one fourth of them specified such pages compared to 16% of women).

In association with financial participation in flood protection, men four times more often talked about the personal responsibility of those who live/own properties within the flood zones. Women more often mentioned “selective” participation, and they also tended more to “excuse” the people from paying – especially the “why should they pay only because they live there” kind of commentary. This assertion made the difference between them (it appeared in 15% of women’s answers) and men (who did not mention it at all). In general, however, women were less willing (24%) to participate directly. On the other hand, women in more than half of the cases, agreed with the flood tax (compared to about 40% in the case of men). Approximately twice more often women stated that the tax is a right thing, but also that someone else (predominantly the state/government) should secure the financial resources. Men nearly three times more frequently mentioned the obscurities related to the ways money were used during and after floods, and twice times more often said that paying the tax is unfair or that they just do not want to pay it.

Our results are rather at odds with the findings of other researchers. Studies of Box et al. (2016), Duží et al. (2017) or Miceli et al. (2008) suggest men’s propensity (a higher one compared to women) to adopt protective and mitigation behaviours. In our study, however, women were more concerned about, and involved in some practical mitigation measures and preparations. Based on other studies as well, higher risk perception (Bubeck et al., 2012; Ho et al., 2008; Kellens et al., 2011; Miceli et al., 2008) and evaluation of flood damages as more severe (Bird et al., 2013), could be expected among women. Yet our findings do not confirm such expectations, since in both cases men’s and women’s views were relatively equal. Unlike the studies of Raschky et al. (2013) or Henstra et al. (2018), suggesting there are no significant gender-associated differences in willingness to pay for flood protection, in our study such differences were found. Women are more in favour of this kind of aid than men, yet the amount of contribution cannot be too demanding. Indications of differences associated with preferred information resources (Box et al., 2016; Brilly and Polic, 2005) were supported by our findings only partly.

#### 4.8 The role of education

Amongst the respondents with the lowest educational level (basic education), the preference of floods-related strategy related to watching news, weather forecasts and the Internet attained the relatively highest value (almost 24%). On the contrary, higher educational levels (the highest values for those with a university degree) meant higher preferences for reactive strategies (escape, evacuation), mitigation strategies (moving the furniture and using appropriate materials, using sandbags), and precautionary and protective measures (having things packed and ready, building protective barriers).

Higher education meant also higher incidence of commentaries associated with the awareness of the constant threat, but also with optimism about the future course of floods. Lower educational levels were linked with more remarks about fear or about someone else’s blame for floods. Respondents with basic education also attributed the least significance to floods with respect to the local quality of life.

In line with the declared preferences for floods-related strategies, the lowest educational level was associated with the highest preference of the Internet as a source of floods-related information. Somewhat paradoxically, however, respondents from this group were not able (except in one single case) to specify any relevant web page at all, and three quarters of them stated they never use such web pages. For comparison, the higher educational level was associated with increasing interest in acquiring the information through personal contacts, public lectures, newspapers, and less traditional ways of spreading the information (e.g. leaflets, crisis line). Also, the higher the education level, the higher the knowledge about, and the more frequent utilisation of, relevant web pages (in the case of those with a university degree, the proportions reached about 50%).

Education also played a role with respect to funding. The higher the education, the larger the disinclination to participate directly. While nearly half of those with basic education agreed with financial participation, this holds true for less than one quarter of the university educated respondents. The latter group most often (38%) mentioned various “excuses” for why not to pay (“selective” participation or, especially, “someone else should pay” kind of statements). Yet, increasing educational level was also associated with increasing proportions of respondents agreeing with the flood tax (and the declining shares of those lacking knowledge about it); while around 71% of respondents with university degree agreed, the share dropped to 42% among those with basic education. The two groups with higher educational levels more often talked about solidarity and the inexpensiveness of the tax, but they also more often alluded to the overabundance of taxes. The other two groups more often doubted the effectiveness and usefulness of the tax.

Our findings relating to educational level are partly in line those of other researchers. In our study, respondents with higher levels of education were not willing to pay more for flood protection (cf. Henstra et al., 2018). As our data suggest, they rather preferred to pay the less demanding flood tax. Corresponding to Armas et al. (2015), we found that higher education was not linked with increased flood awareness – yet it is true that respondents with higher education more often, in their (additional) commentaries, talked about a constant flood threat. The studies of Botzen et al. (2009) or Hudson et al. (2020b) indicate that higher levels of education might be associated with lower perceived risk or flood probability (such a finding was not confirmed by our study) and with expectations of less severe consequences of floods. As for this second finding, our results show that, on the one hand, people with higher education, compared to those with lower levels of education, considered floods to be a more important factor in local quality of life; on the other hand, however, they more often stated optimistic views about future floods. A partial explanation of such optimism might reside in what was asserted by Ho et al. (2008): more educated people have a better overview of relevant information and of particular mitigation measures, and so they feel that they have more control over potential disaster. Similarly, Hudson et al. (2020b) think that higher levels of education may be associated with higher sense of self-efficacy, i.e. of capability to employ adaptive behaviours. Our data show that respondents with higher levels of education demonstrated better knowledge and higher frequency of utilisation of relevant web pages, more frequently they adopted some floods-relevant strategies or mitigation measures, and also less often blamed someone else for the presence of the threat. The views that higher educational

levels might mean higher personal responsibility and likelihood to adopt private mitigation measures (Henstra et al., 2018; Soane et al., 2010), as well as better knowledge about floods (Botzen et al., 2009; Ho et al., 2008; Lave and Lave, 1991), were thus supported by our study.

#### 4.9 Summary of findings and the viewpoint of PMT

We have found that most of the people living in the case study flood-prone areas do not actively engage in mitigation activities, especially when taking into account private mitigation measures. Since, as our data suggest, such a situation seems to result from an interplay of several factors, the PMT (Section 2.5) can serve as useful guidance for explanation.

From the viewpoint of PMT, individual motivations to adopt protection/mitigation behaviours are based on the interaction of the threat appraisal and the coping appraisal (Birkholz et al., 2014; Bubeck et al., 2013; Fox-Rogers et al., 2016; Grothmann and Reusswig, 2006). Both of these perceptual variables need to be at a high level in order to prompt mitigation action (Babicky and Seebauer, 2017). Threat appraisal consists of the perceived probability of a threat (i.e. in this case, a flood), the level of which was, in our study area, generally high, and of the perceived consequences (and their severity) of a threat, the observed level of which was rather moderate to low. A partial explanation of why most local residents do not adopt any mitigation behaviours/measures/strategies or underutilise the relevant information, is thus that though they are aware of the threat’s constant presence, their overall threat appraisal is simply not high enough to motivate them to engage personally.

Another factor that needs to be considered as well is the frequent occurrence of wishful and fatalistic thoughts, resignation and a sense of helplessness, avoidance, or conjectures of someone else’s responsibility. Firstly, such views and standpoints (further) undermine the general motivation to act (Bubeck et al., 2013). Secondly, they do the same, even in cases of those people whose motivation to act should be presumably higher, i.e. of those who were personally affected by floods in the past, and who, compared to the unaffected, subjectively assessed the floods’ consequences as much more significant (and thus their overall threat appraisal could be, at least potentially, higher as well). A third factor is the effect, described in previous points, that can be reinforced if standpoints such as fatalism, resignation or helplessness, meet with emotions such as fear or worries, i.e. with the emotions which appeared regularly in the respondents’ commentaries as well (see previous parts of Section 4), and which should otherwise motivate people to take up precautionary measures (Grothmann and Reusswig, 2006). Another (fourth) issue is the propensity to take such views and standpoints usually means that people’s coping appraisal, i.e. the second main component of PMT (expressing how people assess their abilities, including the financial options, to adopt mitigation measures and their efficiency in reducing the risk), is low (Fox-Rogers et al., 2016; Grothmann and Reusswig, 2006).

In our study area, therefore, not only the threat appraisal but also the coping appraisal seems to be an issue. The vagueness in what to do, and the widespread presence of “strategies” not really able to mitigate the floods’ direct consequences, suggest that local residents doubt their own abilities and self-efficacy in adopting measures effective enough to reduce the damages and losses. Naturally, in cases of particular groups of locals the situation varies.

For instance, as our data suggest, the sense of self-efficacy seems to be higher among respondents with higher educational levels. Costs are an indispensable part of the coping appraisal as well, and our observation that perceived floods-related costs represent an issue for many people living in flood prone areas is a finding that is not exceptional in the Czech Republic (Bera and Daněk, 2018; Duží et al., 2017; Raška et al., 2020), or elsewhere (Kuhlicke et al., 2020; Soane et al., 2010). As recently shown by Hudson (2020), the Czech Republic belongs to a group of European countries displaying the highest rates of unaffordability – indeed, many respondents in our study clearly stated that participating financially in mitigation activities is, either for them personally or for their neighbours, unaffordable. Issues of costs and affordability are linked also with questions about insurance: not only do the pay-outs not completely cover the costs of eventual reconstruction, thus leaving the households to draw the resources from their fixed/limited budget (Duží et al., 2017), but the insurance itself is, as indicated by relatively high proportion of respondents, unaffordable or even inaccessible (see Sections 3.2 and 4.4) for many of them. Not surprisingly, then, some respondents expressed feelings of injustice as regards their potential (additional) financial participation, especially in cases where they already paid for the high insurance premiums. And the frequently occurring unwillingness to pay associated with references to the responsibility of somebody else, also does not seem to be a surprise since, as explained by Soane et al. (2010), perceived costs act as grounds for responsibility transfers.

The importance of costs is reflected also in the relatively higher support for the less demanding flood tax, suggesting that people tend to be solidary and do not have to principally refuse to financially participate, yet the expenses cannot be too high, and, moreover, the utilisation of the resources must be transparent. Naturally, it is not clear from our data what the prevailing standpoints regarding the tax would be in the case that it was better known to people, and how the local residents' views on costs and financial participation are influenced by the prevalence of the state's recovery expenditures and ex-post compensations in the Czech Republic (see Section 3.2). As indicated by the studies of Raschky et al. (2013) or Slavikova (2018), however, some of the issues of insurance, perceived costs, or personal responsibility and engagement, might be influenced by the crowding-out effect (Section 2.3).

## 5. Conclusions and policy implications

Building upon the recent state of knowledge and the relevant theoretical background, this study has explored floods-related attitudes and the behaviours of inhabitants of a flood-prone area in the region of South Bohemia. The study has supported some of the key factors previously identified as influencing flood-preparedness, but some of the findings were at odds with those recorded elsewhere. Moreover, several findings of the study brought out some novel insights and incentives for further research.

Our results show that:

1. A minority of the local population has some strategy or take some mitigation measures to deal with a flood. Furthermore, most of the stated “strategies”, in fact, cannot mitigate either the threat or the consequences of floods. A large part of them represent general or vague recommendations, ineffective procedures, statements of resignation, or even mockery. Reactive procedures associated with an already present threat outnumber
2. A dominant part of the study area's local population is very well aware of the constant threat of floods. In line with the previous conclusion, the general awareness and preparedness are undermined by widespread presence of wishful thinking, fatalism, and transfer of responsibility. A similar effect can be associated with the perception of floods' influence upon the local quality of life: while around one third of locals think such an influence is significant (or rather significant), those who consider floods to be less significant or insignificant prevail;
3. Local people, in general, feel sufficiently informed both about the threat, and about the possibilities of the threat's mitigation; a minority of them asks for any additional information. Local sources of information (broadcasting, personal contacts, warning systems) are preferred as well as the Internet. A minority of locals, however, knows and uses the relevant web pages, and if they do so, they mostly utilise them only once the threat is imminent;
4. An unwillingness to participate financially in flood protection or prevention activities and measures prevails. Yet, relatively large proportions of locals are in favour of such an idea. Especially in case of the flood tax, if conditions such as transparency in using the resources or reasonability of payments would be met, those people agreeing with some kind of “smaller” financial participation could potentially prevail;
5. Local people previously affected by floods, compared to those unaffected, attribute more importance to flood preparedness and to the uptake of mitigation measures. They associate the flood threat with specific emotions (fear), thoughts (wishful thinking), or environmental cues (rain, river); they consider the influence of floods upon local quality of life to be much more significant; they are more interested in utilising information sources and they know them better; but they are more sceptical and less willing to participate financially in a flood protection;
6. Older people, compared to those younger, seem to be more accustomed to floods, taking them as a regular (though not insignificant) part of their lives and something that can be dealt with one way or another. To acquire and share information, they prefer personal contacts and do not utilise the Internet. Rather than relying on any specific mitigation strategies, they consider it a better idea not to live in flood-prone areas, or, in case of life in such areas, simply to get along with such a life somehow. They are also more sceptical regarding personal responsibility for flood mitigation, and regarding the effectivity (and transparency) of using any financial resources to tackle floods. The youngest people, compared to the other age groups, least often talk about the need to avoid life and construction in flood-prone areas; they rely on the Internet and other (electronic) media as sources of relevant information; they favour reactive strategies over prevention and preparedness; and they most often point to the personal responsibility of the people living in the flood-prone areas, and, on this grounds, are more in favour of financial participation in flood protection;
7. In perceiving, and reacting to floods, local women, compared to men, appear to be more personally involved and emotional; fear, hope, care, empathy, mercy, etc. are much more prevalent amongst them. Women also attach



much more importance to prevention and mitigation of the threat and its consequences. Men, on the other hand, tend to emphasise awareness, information, reasons, responsibility and blame; at the same time they seem to be more self-confident and elevated over worries. Men are also more cautious and sceptical about financial participation in flood protection, while women are rather willing to participate based on the principle of solidarity than on duty;

8. Amongst the local people, those with higher educational levels (and especially those with a university degree) demonstrate higher interest in being prepared for floods, and more frequent uptake of mitigation measures; they are more self-confident and optimistic about floods; they utilise a wider spectrum of information sources (and more often ask for their improvement); they have better knowledge of relevant web sites, and use them more frequently; and they prefer financial participation based on solidarity (the tax) rather than on personal responsibility. Lower educational levels (and especially the basic education) are, on the other hand, associated with more fear, worries and blaming; with preference for the Internet as a source of information and, together with other electronic media, as a basis of preparedness (yet, also, with the lowest knowledge of relevant web pages and their least frequent utilisation). The lowest educational levels expressed the highest agreement with direct financial participation and more scepticism about the flood tax, and with less significance attributed to floods as factor influencing the quality of locals' life;
9. The application of PMT points to several factors explaining why most people living in the study area do not adopt any mitigation measures or strategies. Firstly, though they are well aware of the constant threat, their overall threat appraisal is lowered by the medium to low importance attributed to the floods' influence upon local quality of life. This importance, and thus the threat appraisal as well, is higher in some groups of local residents, mainly among those previously affected by floods; yet their awareness and preparedness are often hampered by the non-protective responses (such as wishful thoughts), the widespread presence of which also indicates the low degree of coping appraisal within the local population in general. Thus, locals seem to be uncertain and self-doubting regarding their abilities to mitigate the threat effectively, stating the related costs and the responsibility of somebody else, as some of the main impediments to their (more active) engagement and participation. It is unclear, however, to what extent the significance of perceived costs is influenced by the issues of (un)affordability, and to what extent by the crowding-out effect associated with the prevalence of the state's floods-related recovery/ex-post/ad hoc expenditures in the Czech Republic.

There are several challenges and issues that need to be addressed by relevant policy or programs in the study area or elsewhere, in order to stimulate and bolster personal responsibility, flood preparedness, and the uptake of private mitigation measures. First, the effectiveness of private mitigation measures and the drawbacks of non-protective responses need to be addressed and communicated properly. Our findings show how the vagueness in what to do, the underestimation of or hesitations about one's own abilities to face and mitigate the threat and its consequences, and the reliance upon non-protective responses (e.g. wishful thinking, fatalism), weaken general preparedness. Second, to

achieve effective communication and cooperation, trust must be developed and sustained between various actors, including (local) governments and inhabitants: our study demonstrates how the perceived lack of transparency in handling the floods-relevant resources and the resulting doubts and uncertainty, undermine responsibility and solidarity. On the other hand, and importantly, trust cannot be interchanged with over-reliance upon the help of someone else (e.g. government, other members of the community), and this raises the importance of partnerships encompassing mutual interest and shared duties and accountability. Third, in line with the second recommendation, the (potential) polarisation of local community as "us" and "them" (such as "those affected" and "those unaffected"; "those who should pay and those who should not", etc.) needs to be addressed carefully: our study implies how such a polarisation, associated with disinterest or ignorance, might weaken the social bonds, mutual trust and solidarity, and the general sense of community and flood preparedness. Our observations, however, also suggest how the issue might be diminished through empathy, possibly supported by sharing the views, experience and feelings with one another (for instance, sharing the different views of floods' consequences for the local quality of life could serve here as one of the suitable departure points). A fourth element is that the characteristics of local populations, such as their socio-demographic attributes or those relating to a previous experience with floods, need to be carefully considered in the planning and decision-making processes. Our results show how these characteristics are linked with distinct views on floods-related issues and with pertinent behaviours. Finally, governmental assistance seems to be in need in the case of individual limited options to realise particular measures on their own, or in cases of specifically vulnerable parts of population. In our study, for instance, we show how certain people may experience difficulties with taking out insurance or the costs of flood mitigation measures and activities. The system of such an assistance, however, needs to be developed constantly, taking into account the interlinked issues of (un)affordability, social (in)equality and (in)justice, and personal responsibility (including the implications of the crowding-out effect).

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## References:

- ARMAS, I., IONESCU, R., POSNER, C. N. (2015): Flood risk perception along the Lower Danube River, Romania. *Natural Hazards*, 79(3): 1913–1931.
- BABCICKY, P., SEEBAUER, S. (2017): The two faces of social capital in private flood mitigation: opposing effects on risk perception, self-efficacy and coping capacity. *Journal of Risk Research*, 20(8): 1017–1037.
- BAMBERG, S., MASSON, T., BREWITT, K., NEMETSCHKE, N. (2017): Threat, coping and flood prevention – A meta-analysis. *Journal of Environmental Psychology*, 54: 116–126.

- BERA, M. K., DANĚK, P. (2018): The perception of risk in the flood-prone area: a case study from the Czech municipality. *Disaster Prevention and Management*, 27(1): 2–14.
- BIRD, D., KING, D., HAYNES, K., BOX, P., OKADA, T., NAIRN, K. (2013): Impact of the 2010/11 floods and the factors that inhibit and enable household adaptation strategies. Report. Gold Coast, QLD, Australia: National Climate Change Adaptation Research Facility.
- BIRKHOLZ, S., MURO, M., JEFFREY, P., SMITH, H. M. (2014): Rethinking the relationship between flood risk perception and flood management. *Science of the Total Environment*, 478: 12–20.
- BLÖSCHL, G., HALL, J., VIGLIONE, A. et al. (2019): Changing climate both increases and decreases European river floods. *Nature*, 573(7772): 108–111.
- BOTZEN, W. J. W., AERTS, J. C. J. H., VAN DEN BERGH, J. C. J. M. (2009): Dependence of flood risk perceptions on socioeconomic and objective risk factors. *Water Resources Research*, 45(10): W10440.
- BOX, P., BIRD, D., HAYNES, K., KING, D. (2016): Shared responsibility and social vulnerability in the 2011 Brisbane flood. *Natural Hazards*, 81(3): 1549–1568.
- BOX, P., THOMALLA, F., VAN DEN HONERT, R. (2013): Flood Risk in Australia: Whose Responsibility Is It, Anyway? *Water*, 5(4): 1580–1597.
- BRÁZDIL, R., DOBROVOLNÝ, P., KAKOS, V., KOTYZA, O. (2006): Historical and recent floods in the Czech Republic: causes, seasonality, trends, impacts. In: Schanze, J., Zeman, E., Marsalek, J. [eds.]: *Flood Risk Management: Hazards, Vulnerability and Mitigation Measures*. NATO Science Series, 67: 247–259.
- BRILLY, M., POLIC, M. (2005): Public perception of flood risks, flood forecasting and mitigation. *Natural Hazards and Earth System Sciences*, 5(3): 345–355.
- BROŽA, V. (2005): *Přehrady Čech, Moravy a Slezska*. Liberec: Knihy555.
- BUBECK, P., BOTZEN, W. J. W., AERTS, J. C. J. H. (2012): A review of risk perceptions and other factors that influence flood mitigation behaviour. *Risk Analysis*, 32(9): 1481–1495.
- BUBECK, P., BOTZEN, W. J. W., KREIBICH, H., AERTS, J. C. J. H. (2013): Detailed insights into the influence of flood-coping appraisals on mitigation behaviour. *Global Environmental Change*, 23(5): 1327–1338.
- BURNINGHAM, K., FIELDING, J., THRUSH, D. (2008): 'It'll never happen to me': understanding public awareness of local flood risk. *Disasters*, 32(2): 216–238.
- CASHMAN, A. C. (2011): Case study of institutional and social responses to flooding: reforming for resilience? *Journal of Flood Risk Management*, 4(1): 33–41.
- CUTTER, S., BORUFF, B., SHIRLEY, L. W. (2003): Social vulnerability to environmental hazards. *Social science quarterly*, 84(2): 242–261.
- DRÁB, A., ŘÍHA, J. (2010): An approach to the implementation of European Directive 2007/60/EC on flood risk management in the Czech Republic. *Natural Hazards & Earth System Sciences*, 10(9): 1977–1987.
- DUŽÍ, B., VIKHROV, D., KELMAN, I., STOJANOV, R., JUŘÍČKA, D. (2017): Household measures for river flood risk reduction in the Czech Republic. *Journal of Flood Risk Management*, 10(2): 253–266.
- DZIALEK, J., BIERNACKI, W., BOKWA, A. (2013): Challenges to social capacity building in flood-affected areas of southern Poland. *Natural Hazards and Earth System Sciences*, 13: 2555–2566.
- FOX-ROGERS, L., DEVITT, C., O'NEILL, E., BRERETON, F. J., CLINCH, J. P. (2016): Is there really "nothing you can do"? Pathways to enhanced flood-risk preparedness. *Journal of Hydrology*, 543: 330–343.
- FRANTÁL, B., MALÝ, J. (2017): Close or renew? Factors affecting local community support for rebuilding nuclear power plants in the Czech Republic. *Energy Policy*, 104: 134–143.
- GROTHMANN, T., REUSSWIG, F. (2006): People at Risk of Flooding: Why Some Residents Take Precautionary Action While Others Do Not. *Natural Hazards*, 38(1/2): 101–120.
- Haidu, I., NICOARĂ, M. E. (2011): GIS procedure for the identification of existing infrastructure in flooding areas. *Geographia Technica*, 14(2): 30–44.
- HENSTRA, D., THISTLETHWAITE, J., BROWN, C., SCOTT, D. (2018): Flood risk management and shared responsibility: Exploring Canadian public attitudes and expectations. *Journal of Flood Risk Management*, 12: e12346.
- HO, M., SHAW, D., LIN, S., CHIU, Y. (2008): How Do Disaster Characteristics Influence Risk Perception? *Risk Analysis*, 28(3): 635–643.
- HSIEH, H. F., SHANNON, S. E. (2005): Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, 15(9): 1277–1288.
- HUDSON, P. (2020): The Affordability of Flood Risk Property – Level Adaptation Measures. *Risk Analysis*, 40(6): 1151–1167.
- HUDSON, P., BOTZEN, W. J. W., AERTS, J. C. J. H. (2019): Flood insurance arrangements in the European Union for future flood risk under climate and socioeconomic change. *Global Environmental Change*, 58(September): 101966.
- HUDSON, P., DE RUIG, L. T., DE RUITER, M. C., KUIK, O. J., BOTZEN, W. J. W., LE DEN, X., PERSSON, M., BENOIST, A., NIELSEN, C. N. (2020a): An assessment of best practices of extreme weather insurance and directions for a more resilient society. *Environmental Hazards*, 19(3): 301–321.
- HUDSON, P., HAGEDOORN, L., BUBECK, P. (2020b): Potential Linkages Between Social Capital, Flood Risk Perceptions, and Self-Efficacy. *International Journal of Disaster Risk Science*, 11: 251–262.
- JAKUBCOVÁ, A., GREŽO, H., PETROVIČ, F., HREŠKOVÁ, A. (2016): Impacts of Flooding on the Quality of Life in Rural Regions of Southern Slovakia. *Applied Research in Quality of Life*, 11(1): 221–237.
- KELLENS, W., ZAALBERG, R., NEUTENS, T., VANNEUVILLE, W., MAEYER, P. D. (2011): An analysis of the public perception of flood risk on the Belgian coast. *Risk Analysis*, 31(7): 1055–1068.
- KELLENS, W., TERPSTRA, T., DE MAEYER, P. (2013): Perception and communication of flood risk: a systematic review of empirical research. *Risk Analysis*, 33(1): 24–49.

- KLEMEŠOVÁ, K. (2016): Flood Maps in the Czech Republic: Content, Perception and Information value. E3S Web of Conferences, 7: 10006. EDP Sciences.
- KLEMEŠOVÁ, K., ANDRÁŠKO, I. (2015): Perception of Floods – Towards More Effective Flood Management in the Czech Republic. *Carpathian Journal of Earth and Environmental Sciences*, 10(2): 199–208.
- KUHLICKE, C., SEEBAUER, S., HUDSON, P. et al. (2020): The behavioral turn in flood risk management, its assumptions and potential implications. *WIREs Water*, 7(3): 1–22.
- LAVE, T. R., LAVE, L. B. (1991): Public Perception of the Risks of Floods: Implications for Communication. *Risk Analysis*, 11(2): 255–267.
- MCPHERSON, H. J., SAARINEN, T. F. (1977): Flood plain dwellers' perception of the flood hazard in Tucson, Arizona. *The Annals of Regional Science*, 11(2): 25–40.
- MICELI, R., SOTGIU, I., SETTANNI, M. (2008): Disaster preparedness and perception of flood risk: a study in an alpine valley in Italy. *Journal of Environmental Psychology*, 28(2): 164–173.
- MONTGOMERY, M., KUNREUTHER, H. (2018): Pricing Storm Surge Risks in Florida: Implications for Determining Flood Insurance Premiums and Evaluating Mitigation Measures. *Risk Analysis*, 38(11): 2275–2299.
- OSTI, R., NAKASU, T. (2016): Lessons learned from southern and eastern Asian urban floods: from a local perspective. *Journal of Flood Risk Management*, 9(1): 22–35.
- RASCHKY, P. A., SCHWARZE, R., SCHWINDT, M. et al. (2013): Uncertainty of Governmental Relief and the Crowding out of Flood Insurance. *Environmental and Resource Economics*, 54(2): 179–200.
- RAŠKA, P. (2015): Flood risk perception in Central-Eastern European members states of the EU: a review. *Natural Hazards*, 79(3): 2163–2179.
- RAŠKA, P., WARACHOWSKA, W., SLAVÍKOVÁ, L., AUBRECHTOVÁ, T. (2020): Expectations, disappointments, and individual responses: Imbalances in multilevel flood risk governance revealed by public survey. *Journal of Flood Risk Management*, e12615.
- SIEGRIST, M., GUTSCHER, H. (2008): Natural Hazards and Motivation for Mitigation Behavior: People Cannot Predict the Affect Evoked by a Severe Flood. *Risk Analysis*, 28(3): 771–778.
- SLAVIKOVA, L. (2018): Effects of government flood expenditures: the problem of crowding-out. *Journal of Flood Risk Management*, 11(1): 95–104.
- SOANE, E., SCHUBERT, I., CHALLENOR, P., LUNN, R., NARENDRAN, S., POLLARD, S. (2010): Flood Perception and Mitigation: The Role of Severity, Agency, and Experience in the Purchase of Flood Protection, and the Communication of Flood Information. *Environment and Planning A: Economy and Space*, 42(12): 3023–3038.
- SURMINSKI, S. (2018): Fit for Purpose and Fit for the Future? An Evaluation of the UK's New Flood Reinsurance Pool. *Risk Management and Insurance Review*, 21(1): 33–72.
- SUYKENS, C., PRIEST, S. J., VAN DOORN-HOEKVELD, W. J., THUILLIER, T., VAN RIJSWICK, M. (2016): Dealing with flood damages: will prevention, mitigation, and ex-post compensation provide for a resilient triangle? *Ecology and Society* 21(4): 1.
- TERPSTRA, T., GUTTELING, J. M. (2008) Households' Perceived Responsibilities in Flood Risk Management in The Netherlands. *International Journal of Water Resources Development*, 24(4): 555–565.
- THIEKEN, A. H., PETROW, T., KREIBICH, H., MERZ, B. (2006): Insurability and mitigation of flood losses in private households in Germany. *Risk Analysis*, 26(2): 383–395.
- VARI, A., LINNEROOTH-BAYER, J., FERENCZ, Z. (2003): Stakeholder views on flood risk management in Hungary's upper Tisza Basin. *Risk Analysis*, 23(3): 585–600.
- VÁVRA, J., LAPKA, M., CUDLÍNOVÁ, E., DVOŘÁKOVÁ-LÍŠKOVÁ, Z. (2017): Local perception of floods in the Czech Republic and recent changes in state flood management strategies. *Journal of Flood Risk Management*, 10(2): 238–252.
- WACHINGER, G., RENN, O., BEGG, C., KUHLICKE, C. (2013): The risk perception paradox—Implications for governance and communication of natural hazards. *Risk Analysis*, 33(6): 1049–1065.
- WALLACE, J. W., POOLE, C., HORNEY, J. A. (2016): The association between actual and perceived flood risk and evacuation from Hurricane Irene, Beaufort County, North Carolina. *Journal of Flood Risk Management*, 9(2): 125–135.

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